Improvements of Motion Vector in Variational Echo Tracking Technique by Correction of Initial Guess

POSTER-10

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1. INTRODUCTION

❖ **Backgrounds : Variational Echo Tracking (VET) in MAPLE**

- Since the scaling-guessing method uses one initial guess as a constant, it is difficult to estimate the motion vector in the beam blockage or weak echo area.
- The accuracy of the motion vector directly affects prediction accuracy of MAPLE.
  - ➢ McGill Algorithm for Precipitation nowcasting by Lagrangian Extrapolation(MAPLE)

❖ **Purposes : Improvements of motion vectors in VET**

- In order to improve the quality of motion vectors of VET, initial guess correct by using analysis field of numerical model and Doppler radar wind field.

2. DATA

❖ **Radar Reflectivity field**

- CMAX(column max) of reflectivity (10 KMA radars)
- HSR(Hybrid Surface Radar) of reflectivity

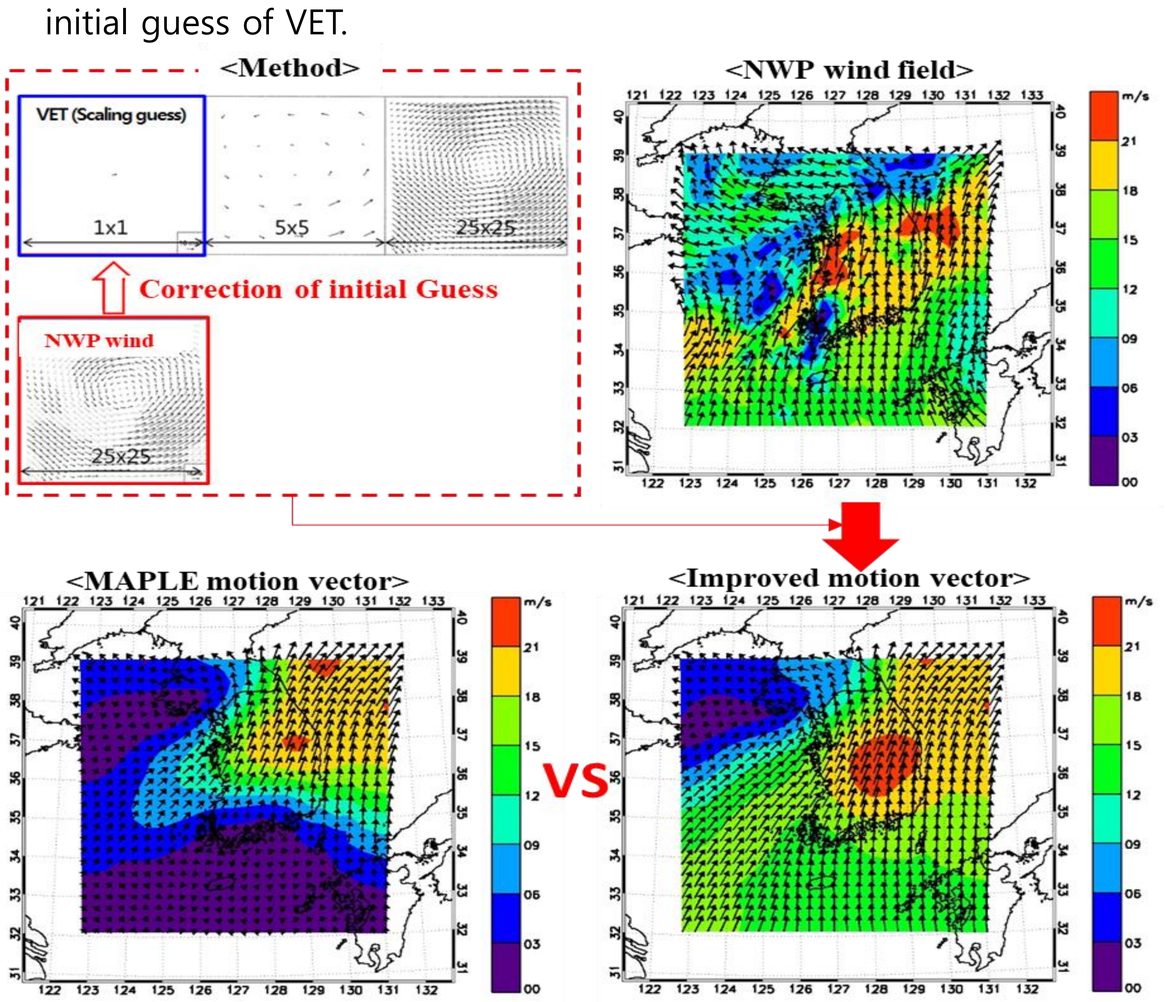
❖ **Korea Local Analysis and Prediction System (KLAPS)**

- Analysis wind field of numerical model : 700 hPa

3. METHODOLOGY

❖ **Correction of initial guess**

- The motion vectors are calculated over 25*25 sub-area using a constant as initial guess by scaling-guessing method.
- A motion vector at each grid is then derived by bilinear interpolation using the 25*25 motion vector to apply the semi-Lagrangian advection.
- We applied 700 hPa wind field of KLAPS instead of a constant as initial guess of VET.



❖ **Skill scores**

- Using contingency table

Bias score (BIAS)		Probability Of Detection (POD)	
(F+H)/(M+H)		H/(M+H)	
False Alarm Ratio (FAR)		**Critical Success Index (CSI)**	
F/(F+H)		H/(H+M+F)	
Contingency table		**Forecast**	
		Yes	**No**
Observation	**Yes**	H (Hit)	M (Miss)
	No	F (False Alarm)	C (Correctional reject)

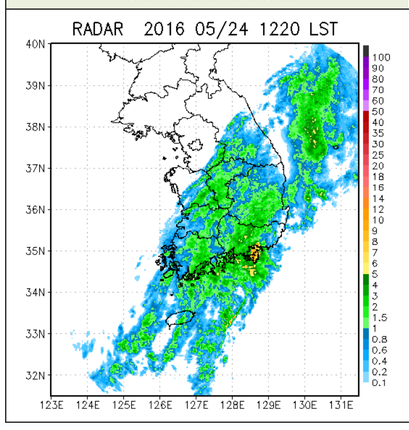
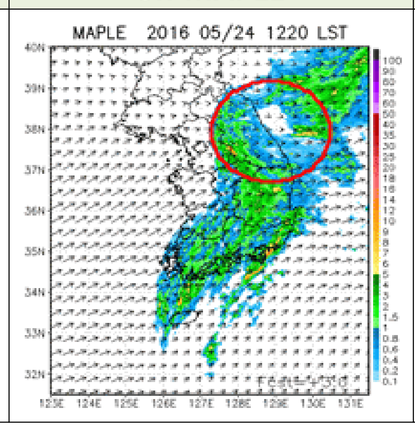
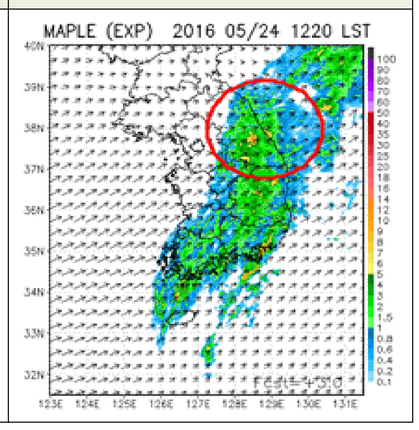
- Using rain gauge
  - Mean Error(ME), Mean Absolute Error(MAE)
  - Relative Root Mean Square Error (RRMSE), Correlation Coefficient (CC)

4. CASE STUDY

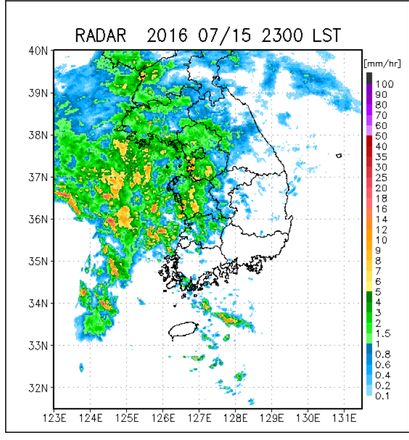
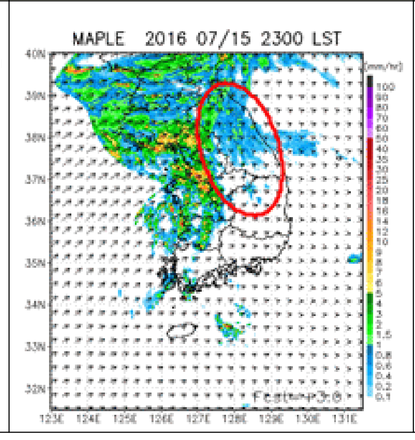
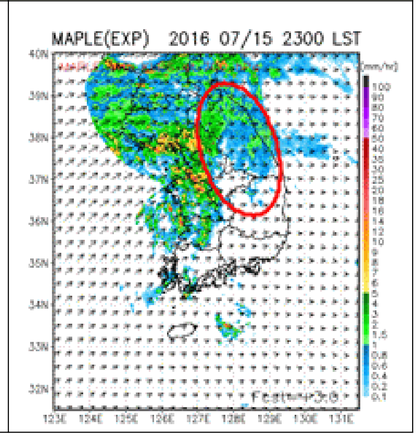
❖ **3h forecast reflectivity field from MAPLE (Summer season)**

- **CASE1:** 24 May, 2016 09:20 LST, **CASE2:** 15 July, 2016 20:00 LST
- Underestimation of motion vectors according to beam blockage and ground echo
- Correction of initial guess of VET using KLAPS

CASE1

Observation	3h MAPLE	Correction
		

CASE2

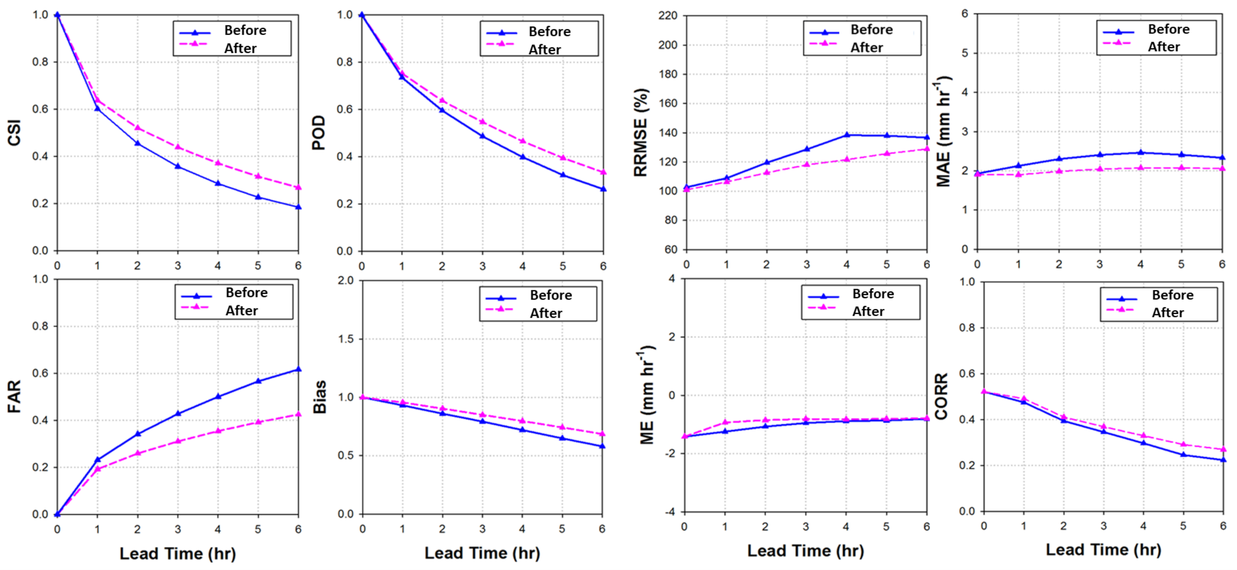
Observation	3h MAPLE	Correction
		

5. VERIFICATION

❖ **Improved MAPLE Skill scores according to correction of motion vector**

- Period : 1 May ~ 31 Oct., 2016 (6 month)

CSI score	+1h	+2h	+3h	+4h	+5h	+6h
MAPLE	0.60	0.44	0.36	0.29	0.22	0.18
MAPLE(Correction)	0.64	0.53	0.44	0.38	0.31	0.26
Improvement rate(%)	**6.7**	**20.5**	**22.2**	**31**	**40.9**	**44.4**



6. SUMMARY

❖ Correction of initial guess of VET using wind fields of KLAPS solved the problem of underestimation of motion vectors in the beam blockage and ground echo area.

❖ As a result of applying the improved motion vector to semi-Lagrangian advection, prediction accuracy of MAPLE was improved by 22% for 3-h forecast and the distortion of the precipitation shape is also reduced.

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